

CLAIMS

1 1. A recombinant microorganism that displays on its surface a binding
2 moiety that, when administered to an animal, competes with a ligand for binding to a receptor
3 for the ligand, wherein the binding moiety comprises an oligosaccharide which comprises a
4 sugar residue that is attached to an acceptor moiety by a glycosyltransferase that is encoded
5 by an exogenous nucleic acid which is present in the microorganism.

1 2. The recombinant microorganism of claim 1, wherein the microorganism
2 is selected from the group consisting of bacteria, fungi, Mycoplasma, and yeast.

1 3. The recombinant microorganism of claim 1, wherein the oligosaccharide
2 further comprises at least a second sugar residue that is attached to an acceptor moiety by at
3 least a second glycosyltransferase.

1 4. The recombinant microorganism of claim 3, wherein the second
2 glycosyltransferase is encoded by a second exogenous nucleic acid which is present in the
3 microorganism.

1 5. The recombinant microorganism of claim 1, wherein the receptor is
2 present on a surface of a cell.

1 6. The recombinant microorganism of claim 5, wherein the cell is an
2 epithelial or endothelial cell that comprises a mucosal membrane of an animal.

1 7. The recombinant microorganism of claim 1, wherein the binding moiety
2 is a mimic of a receptor for a toxin or adhesin of a pathogenic organism.

1 8. The recombinant microorganism of claim 7, wherein the toxin is an
2 enterotoxin.

1 9. The recombinant microorganism of claim 7, wherein the toxin is selected
2 from the group consisting of shiga toxins, clostridial toxins, cholera toxins, *E. coli*
3 enterotoxins, and Staphylococcal enterotoxins.

1 10. The recombinant microorganism of claim 9, wherein the toxin is a shiga
2 toxin.

1 11. The recombinant microorganism of claim 10, wherein the shiga toxin is
2 selected from the group consisting of, Stx, Stx1, Stx2, Stx2c, Stx2d, and Stx2e.

1 12. The recombinant microorganism of claim 11, wherein the microorganism
2 displays on its surface a mimic for all of the receptors in the group consisting of Stx1, Stx2,
3 Stx2c and Stx2d.

1 13. The recombinant microorganism of claim 9, wherein the toxin is a
2 clostridial toxin.

1 14. The recombinant microorganism of claim 13, wherein the clostridial
2 toxin is selected from the group consisting of tetanus toxin, botulinum toxin, and *C. difficile*
3 toxins A and B.

1 15. The recombinant microorganism of claim 9, wherein the toxin is selected
2 from the group consisting of cholera toxin, *E. coli* heat labile enterotoxin types I and II, and
3 ST toxins.

1 16. The recombinant microorganism of claim 7, wherein the binding moiety
2 is a mimic of an adhesin receptor.

1 17. The recombinant microorganism of claim 16, wherein the adhesin is a
2 CFA adhesin of an enterotoxigenic *E. coli*.

1 **18.** The recombinant microorganism of claim 17, wherein the binding moiety
2 is a mimic of a receptor for *E. coli* CS3 pili.

1 **19.** The recombinant microorganism of claim 17, wherein the binding moiety
2 is a mimic of a receptor for K88ad fimbriae.

1 **20.** The recombinant microorganism of claim 16, wherein the binding moiety
2 is a mimic of a receptor for an adhesin of *Entamoeba histolyticum*.

1 **21.** The recombinant microorganism of claim 16, wherein the binding moiety
2 is a mimic of a receptor for an adhesin of a virus.

1 **22.** The recombinant microorganism of claim 21, wherein the virus is a
2 rotavirus.

1 **23.** The recombinant microorganism of claim 22, wherein the rotavirus is a
2 porcine rotavirus.

1 **24.** The recombinant microorganism of claim 1, wherein the binding moiety
2 is a mimic of a receptor for a virus.

1 **25.** The recombinant microorganism of claim 1, wherein the binding moiety
2 competes with a pathogenic organism for binding to a corresponding receptor on an animal
3 epithelial or endothelial cell.

1 **26.** The recombinant microorganism of claim 25, wherein the
2 oligosaccharide comprises a terminal sialic acid or galactose residue.

1 **27.** The recombinant microorganism of claim 26, wherein the pathogenic
2 organism is selected from the group consisting of *Staphylococcus pneumonia*, *H. influenza*,
3 *H. parainfluenza*, *Chlamydia trachomatis* and *Pseudomonas spp.*

1 **28.** The recombinant microorganism of claim 25, wherein the
2 oligosaccharide comprises a terminal mannose residue and the pathogenic organism is
3 *Acanthamoeba*.

1 **29.** The recombinant microorganism of claim 25, wherein the
2 oligosaccharide comprises a terminal fucose residue.

1 **30.** The recombinant microorganism of claim 29, wherein the
2 oligosaccharide comprises a $\text{Fuc}\alpha 1,2\text{-Gal}$ moiety and the pathogenic organism is *Candida*
3 *albicans*.

1 **31.** The recombinant microorganism of claim 29, wherein the
2 oligosaccharide comprises a 2'-Fuc or a 3'-Fuc linkage.

1 **32.** The recombinant microorganism of claim 31, wherein the pathogenic
2 organism is *Helicobacter pylori*.

1 **33.** The recombinant microorganism of claim 1, wherein the binding moiety
2 is a mimic of a receptor for a cell involved in inflammation.

1 **34.** The recombinant microorganism of claim 33, wherein the
2 oligosaccharide comprises a 3'-sialoside or a 6'-sialoside.

1 **35.** The recombinant microorganism of claim 33, wherein the
2 oligosaccharide comprises sialyl Lewis^x or sialyl Lewis^a.

1 **36.** The recombinant microorganism of claim 1, wherein the animal is
2 selected from humans, pigs, cows, horses, canines, felines, chickens, turkeys, goats, rabbits,
3 sheep, geese, ducks.

1 **37.** The recombinant microorganism of claim 1, wherein the binding moiety
2 comprises an oligosaccharide selected from the group consisting of:

3 Gal α [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,
4 Gal α [1 \rightarrow 4]Gal β ,
5 GalNAc β [1 \rightarrow 3]Gal α [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,
6 Gal β [1 \rightarrow 4]GlcNAc,
7 Gal α [1 \rightarrow 3]Gal β [1 \rightarrow 4]Glc,
8 Gal α [1 \rightarrow 3]Gal β [1 \rightarrow 4]GlcNAc,
9 Gal β [1 \rightarrow 4]GlcNAc β [1 \rightarrow 3]Gal β [1 \rightarrow 4]Glc,
10 Glc α [1 \rightarrow 6]Glc,
11 Glc α [1 \rightarrow 6]Glc α [1 \rightarrow 6]Glc,
12 NeuNAc,
13 Gal β [1 \rightarrow 3]GalNAc β [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,
14 |
15 NeuNAc α [2 \rightarrow 3]
16 Gal β [1 \rightarrow 3]GalNAc β [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,
17 GalNAc β [1 \rightarrow 4]Gal,
18 GalNAc,
19 Gal,
20 NeuGc \rightarrow GM₃, and
21 NeuNAc \rightarrow GM₃.

1 38. The recombinant microorganism of claim 37, wherein the binding moiety
2 comprises Gal α [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc.

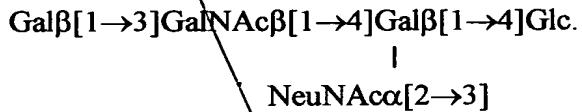
1 39. The recombinant microorganism of claim 37, wherein the binding moiety
2 comprises GalNAc β [1 \rightarrow 3]Gal α [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc.

1 40. The recombinant microorganism of claim 37, wherein the binding moiety
2 comprises an oligosaccharide selected from the group consisting of: Gal β [1 \rightarrow 4]GlcNAc,
3 Gal β [1 \rightarrow 4]GalNAc β [1 \rightarrow 3]Gal β [1 \rightarrow 4]Glc, Gal α [1 \rightarrow 3]Gal β [1 \rightarrow 4]GalNAc and
4 Gal α [1 \rightarrow 3]Gal β [1 \rightarrow 4]Glc.

1 41. The recombinant microorganism of claim 37, wherein the binding moiety
2 comprises NeuNAc.

42. The recombinant microorganism of claim 37, wherein the binding moiety comprises an oligosaccharide selected from the group consisting of $\text{Glc}\alpha[1 \rightarrow 6]\text{Glc}$ and $\text{Glc}\alpha[1 \rightarrow 6]\text{Glc}\alpha[1 \rightarrow 6]\text{Glc}$.

43. The recombinant microorganism of claim 37, wherein the binding moiety comprises the oligosaccharide:



44. The recombinant microorganism of claim 37, wherein the binding moiety comprises an oligosaccharide selected from the group consisting of NeuGc \rightarrow GM₃ and NeuNAc \rightarrow GM₃.

1 **45.** The recombinant microorganism of claim 1, wherein the binding moiety
2 is a mimic of natural receptor for adhesins or toxins produced by a micro-organism selected
3 from a group of genera consisting of *Escherichia*, *Salmonella*, *Shigella*, *Citrobacter*,
4 *Helicobacter*, *Yersinia*, *Vibrio*, *Aeromonas*, *Campylobacter*, *Pseudomonas*, *Pasteurella*,
5 *Neisseria*, *Haemophilus*, *Klebsiella*, *Staphylococcus*, *Streptococcus*, *Clostridium*, rotavirus,
6 and *Entamoeba*.

1 **46.** The recombinant microorganism of claim 1, wherein the microorganism
2 further comprises one or more exogenous enzymes involved in synthesis of a nucleotide sugar
3 which serves as a donor for the glycosyltransferase.

1 **47.** The recombinant microorganism of claim 46, wherein the nucleotide
2 sugar is selected from the group consisting of GDP-Man, UDP-Glc, UDP-Gal, UDP-
3 GlcNAc, UDP-GalNAc, CMP-sialic acid, GDP-Fuc, and UDP-xylose.

48. The recombinant microorganism of claim 46, wherein the enzyme is a nucleotide sugar synthetase.

1 **49.** The recombinant microorganism of claim 46, wherein the enzyme is
2 involved in synthesis of a nucleotide that comprises the nucleotide sugar.

1 **50.** The recombinant microorganism of claim 46, wherein the enzyme is
2 involved in synthesis of a sugar that comprises the nucleotide sugar.

1 **51.** The recombinant microorganism of claim 46, wherein the one or more
2 sugars transferred to the acceptor molecule by the exogenous glycosyltransferases make up
3 the entirety of the receptor mimic.

1 **52.** The recombinant microorganism as in claim 1, wherein a combination of
2 sugars of the acceptor molecule and the one or more sugars transferred to the acceptor
3 molecule by the exogenous transferases make up the entirety of the receptor mimic.

1 **53.** The recombinant microorganism as in claim 1, wherein the completed
2 acceptor molecule has a terminal residue to which the exogenous glycosyltransferases transfer
3 sugars to make up the receptor mimic.

1 **54.** The recombinant microorganism as in claim 1, wherein the acceptor
2 molecule is an incomplete endogenous molecule and at least one of the exogenous
3 glycosyltransferases competes with an endogenous glycosyltransferase to transfer said sugar
4 molecule thereto.

1 **55.** The recombinant microorganism as in claim 1, wherein the binding
2 moiety is anchored to the outer surface of the microorganism.

1 **56.** The recombinant microorganism as in claim 55, wherein the
2 microorganism is gram negative and the acceptor molecule is a lipopolysaccharide.

1 **57.** The recombinant microorganism as in claim 56, wherein the acceptor
2 molecule is all or a portion of the core of the lipopolysaccharide.

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1 58. The recombinant microorganism as in claim 1, wherein said
2 microorganism is selected from a genus selected from the group consisting of *Escherichia*,
3 *Salmonella*, *Acidophilus*, *Lactobacillus*, *Lactococcus* and *Bifidobacterium*.

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1 59. The recombinant microorganism as in claim 58, wherein said
2 microorganism is selected from a species selected from the group consisting of *Escherichia*
3 *coli* and *Salmonella enterica* sv *typhimurium*.

1 60. The recombinant microorganism as in claim 1, wherein the
2 microorganism is chosen by reason of having reduced production of external masking
3 polysaccharide molecules other than said acceptor molecule to enhance exposure of the
4 receptor mimic.

1 61. The recombinant microorganism as in claim 60, wherein the
2 microorganism has reduced production of external molecules selected from the group
3 comprising a slime layer, capsule or exopolysaccharide.

1 62. The recombinant microorganism as in claim 1, wherein the
2 microorganism is selected to provide some resistance to antimicrobial activity of microflora
3 potentially resident in the gut.

1 63. The recombinant microorganism as in claim 1, wherein the
2 microorganism is resistant to the major families of colicins.

1 64. The recombinant microorganism as in claim 1, wherein all or some of the
2 one or more glycosyl transferases are naturally occurring.

1 65. The recombinant microorganism as in claim 1, wherein genes encoding
2 all or some of the one or more glycosyl transferases are modified to stabilise phase variation.

1 66. A recombinant microorganism expressing one or more exogenous sugar
2 transferases, or one or more exogenous nucleotide sugar precursor synthesising enzymes, said

3 microorganism also expressing an acceptor molecule, said one or more exogenous sugar
4 transferases being specific for the transfer of one or more sugar residues represented
5 progressively from a non reducing terminal end of a receptor of either a toxin or an adhesin of
6 a pathogenic organism, the exogenous sugar transferases progressively transferring said one
7 or more sugar resides onto the acceptor molecule to thereby form a chimeric carbohydrate
8 molecule with an exposed receptor mimic, said sugar precursor enzymes forming nucleotide
9 precursors that are transferred to said acceptor molecule to make up said chimeric
0 carbohydrate, said exposed receptor mimic capable of binding the toxin or the adhesin.

1 67. A pharmaceutical preparation for administration to a mucosal surface,
2 said preparation including a delivery microorganism or a partially or fully purified non-toxic
3 preparation of a carbohydrate molecule therefrom, at least a part of said carbohydrate
4 molecule acting as an exposed receptor mimic, said receptor mimic capable of binding a toxin
5 or an adhesin of a pathogen that normally binds to said mucosal surface, said pharmaceutical
6 preparation being carried in a pharmaceutically acceptable excipient.

1 68. The pharmaceutical preparation as in claim 67, wherein the delivery
2 microorganism is a recombinant microorganism expressing one or more exogenous sugar
3 transferases and an acceptor molecule, said one or more exogenous sugar transferases being
4 specific for transfer of one or more sugar residues represented progressively from a non
5 reducing terminal end of a receptor of either a toxin or an adhesin of a pathogenic organism,
6 said delivery microorganism expressing an acceptor molecule, and progressively transferring
7 said one or more sugar resides onto the acceptor molecule to thereby form the chimeric
8 carbohydrate molecule with the receptor mimic, said exposed receptor mimic capable of
9 binding the toxin or the adhesin.

1 69. The pharmaceutical preparation as in claim 67, wherein the receptor
2 mimic is a mimic of the receptor of a toxin.

1 70. The pharmaceutical preparation as in claim 69, wherein the toxin is
2 selected from the group consisting of shiga toxins, clostridial toxins, cholera toxins, *E. coli*
3 enterotoxins, and Staphylococcal enterotoxins.

1 **71.** The pharmaceutical preparation as in claim 70, wherein the toxin is a
2 shiga toxin.

1 **72.** The pharmaceutical preparation as in claim 70, wherein the toxin is a
2 clostridial toxin.

1 **73.** The pharmaceutical preparation as in claim 67, wherein the receptor
2 mimic is partially or wholly formed within a sugar moiety of selected from the group
3 comprising:

4 $\text{Gal}\alpha[1 \rightarrow 4]\text{Gal}\beta[1 \rightarrow 4]\text{Glc}$,
5 $\text{Gal}\alpha[1 \rightarrow 4]\text{Gal}\beta$,
6 $\text{GalNAc}\beta[1 \rightarrow 3]\text{Gal}\alpha[1 \rightarrow 4]\text{Gal}\beta[1 \rightarrow 4]\text{Glc}$,
7 $\text{Gal}\beta[1 \rightarrow 4]\text{GlcNAc}$,
8 $\text{Gal}\alpha[1 \rightarrow 3]\text{Gal}\beta[1 \rightarrow 4]\text{Glc}$,
9 $\text{Gal}\alpha[1 \rightarrow 3]\text{Gal}\beta[1 \rightarrow 4]\text{GlcNAc}$,
10 $\text{Gal}\beta[1 \rightarrow 4]\text{GlcNAc}\beta[1 \rightarrow 3]\text{Gal}\beta[1 \rightarrow 4]\text{Glc}$,
11 $\text{Glc}\alpha[1 \rightarrow 6]\text{Glc}$,
12 $\text{Glc}\alpha[1 \rightarrow 6]\text{Glc}\alpha[1 \rightarrow 6]\text{Glc}$,
13 NeuNAc ,
14 $\text{Gal}\beta[1 \rightarrow 3]\text{GalNAc}\beta[1 \rightarrow 4]\text{Gal}\beta[1 \rightarrow 4]\text{Glc}$,
15 |
16 $\text{NeuNAc}\alpha[2 \rightarrow 3]$
17 $\text{Gal}\beta[1 \rightarrow 3]\text{GalNAc}\beta[1 \rightarrow 4]\text{Gal}\beta[1 \rightarrow 4]\text{Glc}$,
18 $\text{GalNAc}\beta[1 \rightarrow 4]\text{Gal}$,
19 GalNAc ,
20 Gal ,
21 $\text{NeuGc} \rightarrow \text{GM}_3$, and
22 $\text{NeuNAc} \rightarrow \text{GM}_3$.

1 **74.** The pharmaceutical preparation as in claim 67, wherein one or more
2 exogenous nucleotide sugar precursor synthesising enzymes are also expressed by said

3 organism, said sugar precursor enzymes forming precursors to make up said chimeric
4 carbohydrate.

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2 75. The pharmaceutical preparation as in claim 67, wherein genes encoding
3 the all or some of the one or more glycosyl transferases are modified to prevent phase variation.

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2 76. The pharmaceutical preparation as in claim 67, wherein the delivery
3 microorganism is non harmful and live.

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2 77. The pharmaceutical preparation as in claim 67, wherein the delivery
3 microorganism is protected by a protective capsule or held within a protective matrix.

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2 78. The pharmaceutical preparation as in claim 67, wherein the target
3 mucosal surface is gastrointestinal.

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2 79. The pharmaceutical preparation as in claim 78, wherein the delivery
3 microorganism is selected to provide some resistance to antimicrobial activity of microflora potentially resident in the gut.

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2 80. The pharmaceutical preparation as in claim 79, wherein the delivery
3 microorganism is resistant to the major families of colicins.

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2 81. The pharmaceutical preparation as in claim 79, wherein the delivery
3 microorganism is grown under conditions to induce acid tolerance.

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2 82. The pharmaceutical preparation as in claim 78, wherein the delivery
3 microorganism is enteric.

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2 83. The pharmaceutical preparation as in claim 82, wherein the delivery
3 microorganism belongs to an enteric genera selected from the group consisting of
4 *Escherichia*, *Salmonella*, *Acidophilus*, *Lactobacillus*, *Lactococcus*, *Streptococcus* and
Bifidobacterium.

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1 84. The pharmaceutical preparation as in claim 67, wherein the delivery
2 microorganism is killed.

1 85. The pharmaceutical preparation as in claim 84, wherein the delivery
2 microorganism is killed by treatment with a chemical agent selected from the group consisting
3 of formalin or thiomersal, or by treatment with a bactericidal antibiotic, or by exposure to
4 heat or UV irradiation.

1 86. The pharmaceutical preparation as in claim 67, wherein the carbohydrate
2 molecule is lipopolysaccharide and the carbohydrate is delivered as an intact or partially intact
3 membrane preparation selected from the group consisting of bacterial ghosts, liposomes
4 incorporating chimeric lipopolysaccharide or membrane vesicles.

1 87. The pharmaceutical preparation as in claim 67, wherein the carbohydrate
2 is the carbohydrate portion of lipopolysaccharide, and the preparation includes purified or
3 semipurified lipopolysaccharide.

1 88. A method of administering a receptor mimic to a mucosal surface of a
2 mammal, the method comprising the administration of a quantity of a delivery microorganism,
3 or parts thereof, the delivery microorganism exhibiting one or more sugars in a configuration
4 to form an exposed receptor mimic, the receptor mimic being a mimic of a receptor of a
5 pathogen, said quantity being sufficient to reduce adherence of the pathogen or a toxin
6 produced by the pathogen to the mucosal surface.

1 89. The method of administering a receptor mimic as in claim 88, wherein
2 the delivery microorganism is a recombinant microorganism expressing one or more
3 exogenous sugar transferases and an acceptor molecule, said one or more exogenous sugar
4 transferases being specific for transfer of one or more sugar residues represented
5 progressively from a non reducing terminal end of a receptor of either a toxin or an adhesin of
6 a pathogenic organism, the exogenous sugar transferases progressively transferring said one
7 or more sugar residues onto the acceptor molecule to thereby form a chimeric carbohydrate

8 molecule with the exposed receptor mimic being exposed, said exposed receptor mimic
9 capable of binding the toxin or the adhesin.

1 90. The method of administering a receptor mimic as in claim 88, wherein
2 the receptor mimic is a mimic of the receptor of a toxin.

1 91. The method of administering a receptor mimic as in claim 90, wherein
2 the toxin is selected from the group consisting of shiga toxins, clostridial toxins, cholera
3 toxins, *E. coli* enterotoxins, and staphylococcal enterotoxins.

1 92. The method of administering a receptor mimic as in claim 91, wherein
2 the toxin is a shiga toxin.

1 93. The method of administering a receptor mimic as in claim 91, wherein
2 the toxin is a clostridial toxin.

1 94. The method of administering a receptor mimic as in claim 88, wherein
2 the receptor mimic is partially or wholly formed within a sugar moiety of selected from the
3 group comprising:

4 Gal α [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,
5 Gal α [1 \rightarrow 4]Gal β ,
6 GalNAc β [1 \rightarrow 3]Gal α [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,
7 Gal β [1 \rightarrow 4]GlcNAc,
8 Gal α [1 \rightarrow 3]Gal β [1 \rightarrow 4]Glc,
9 Gal α [1 \rightarrow 3]Gal β [1 \rightarrow 4]GlcNAc,
10 Gal β [1 \rightarrow 4]GlcNAc β [1 \rightarrow 3]Gal β [1 \rightarrow 4]Glc,
11 Glc α [1 \rightarrow 6]Glc,
12 Glc α [1 \rightarrow 6]Glc α [1 \rightarrow 6]Glc,
13 NeuNAc,
14 Gal β [1 \rightarrow 3]GalNAc β [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,
15 |
16 NeuNAc α [2 \rightarrow 3]
17 Gal β [1 \rightarrow 3]GalNAc β [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,

18 GalNAc β [1 \rightarrow 4]Gal,
19 GalNAc,
20 Gal,
21 NeuGc \rightarrow GM₃, and
22 NeuNAc \rightarrow GM₃.

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1 95. The method of administering a receptor mimic as in claim 88, wherein
2 the receptor mimic of the purified carbohydrate is partially or wholly formed within a sugar
3 moiety selected from the group comprising

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1 Gal α [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,
2 GalNAc β [1 \rightarrow 3]Gal α [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc, and
3 Gal β [1 \rightarrow 3]GalNAc β [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc.

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1 96. The method of administering a receptor mimic as in claim 95, wherein
2 genes encoding the all or some of the one or more glycosyl transferases are modified to
3 stabilise phase variation.

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1 97. The method of administering a receptor mimic as in claim 88, wherein
2 one or more exogenous nucleotide sugar precursor synthesising enzymes are also expressed
3 by said organism, said sugar precursor enzymes forming precursors to make up said chimeric
4 carbohydrate.

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1 98. The method of administering a receptor mimic as in claim 88, wherein
2 the delivery microorganism is non harmful and live.

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1 99. The method of administering a receptor mimic as in claim 88, wherein
2 the administration is enterally.

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1 100. The method of administering a receptor mimic as in claim 99, wherein
2 the delivery microorganism is protected by a protective capsule or held within a protective
3 matrix.

1 **101.** The method of administering a receptor mimic as in claim 99, wherein
2 the delivery microorganism is selected to provide some resistance to antimicrobial activity of
3 microflora potentially resident in the gut.

1 **102.** The method of administering a receptor mimic as in claim 99, wherein
2 the delivery microorganism is resistant to the major families of colicins.

1 **103.** The method of administering a receptor mimic as in claim 99, wherein
2 the delivery microorganism is grown under conditions to induce acid tolerance.

1 **104.** The method of administering a receptor mimic as in claim 99, wherein
2 the delivery microorganism is enteric.

1 **105.** The method of administering a receptor mimic as in claim 104, wherein
2 the delivery microorganism belongs to an enteric genera selected from the group consisting
3 of Escherichia, Salmonella, Acidophilus, Lactobacillus, Lactococcus and Bifidobacterium.

1 **106.** The method of administering a receptor mimic as in claim 88, wherein
2 the delivery microorganism is killed.

1 **107.** The method of administering a receptor mimic as in claim 106, wherein
2 the delivery microorganism is killed by treatment with a chemical agent selected from the
3 group consisting of formalin, or thiomersal, or a bactericidal antibiotic, or by exposure to heat
4 or to UV irradiation.

1 **108.** The method of administering a receptor mimic as in claim 88, wherein
2 the carbohydrate molecule is lipopolysaccharide and the carbohydrate is delivered as an intact
3 or partially intact membrane preparation selected from the group consisting of bacterial
4 ghosts, liposomes incorporating chimeric lipopolysaccharide or membrane vesicles.

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109. The method of administering a receptor mimic as in claim 88, wherein
the carbohydrate is the carbohydrate portion of lipopolysaccharide and the preparation
includes purified or semipurified lipopolysaccharide.

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110. The method of administering a receptor mimic as in claim 88, wherein
the receptor mimic is that of a porcine rotavirus or shiga like toxin active in pigs, including
the step of adding the delivery microorganism to pig feed or drink.

1 111. A purified chimeric carbohydrate purified from the recombinant
2 organism of claim 1.

1 112. A method of testing for the presence of a toxin or a pathogenic
2 microorganism in a sample, the method comprising:
3 contacting a sample with the purified carbohydrate of claim 89, either the
4 purified carbohydrate or the sample being immobilized;
5 washing off unbound purified carbohydrate or toxin or pathogenic
6 microorganism; and
7 adding detection means to detect bound purified carbohydrate and the
8 toxin or pathogenic microorganism.

1 113. The method of testing as in claim 112, wherein the purified carbohydrate
2 is immobilised on a support.

1 114. The method of testing as in claim 113, wherein the purified carbohydrate
2 is lipopolysaccharide.

1 115. The method of testing as in claim 112, wherein the receptor mimic of the
2 purified carbohydrate is partially or wholly formed within a sugar moiety selected from the
3 group comprising
4 $\text{Gal}\alpha[1 \rightarrow 4]\text{Gal}\beta[1 \rightarrow 4]\text{Glc}$,
5 $\text{Gal}\alpha[1 \rightarrow 4]\text{Gal}\beta$,
6 $\text{GalNAc}\beta[1 \rightarrow 3]\text{Gal}\alpha[1 \rightarrow 4]\text{Gal}\beta[1 \rightarrow 4]\text{Glc}$,

7 Gal β [1 \rightarrow 4]GlcNAc,
8 Gal α [1 \rightarrow 3]Gal β [1 \rightarrow 4]Glc,
9 Gal α [1 \rightarrow 3]Gal β [1 \rightarrow 4]GlcNAc,
10 Gal β [1 \rightarrow 4]GlcNAc β [1 \rightarrow 3]Gal β [1 \rightarrow 4]Glc,
11 Glc α [1 \rightarrow 6]Glc,
12 Glc α [1 \rightarrow 6]Glc α [1 \rightarrow 6]Glc,
13 NeuNAc,
14 Gal β [1 \rightarrow 3]GalNAc β [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,
15 |
16 NeuNAc α [2 \rightarrow 3]
17 Gal β [1 \rightarrow 3]GalNAc β [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,
18 GalNAc β [1 \rightarrow 4]Gal,
19 GalNAc,
20 Gal,
21 NeuGc \rightarrow GM₃, and
22 NeuNAc \rightarrow GM₃.

1 116. The method of testing as in claim 115, wherein the receptor mimic of the
2 purified carbohydrate is partially or wholly formed within a sugar moiety selected from the
3 group comprising

4 Gal α [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc,
5 GalNAc β [1 \rightarrow 3]Gal α [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc; and
6 Gal β [1 \rightarrow 3]GalNAc β [1 \rightarrow 4]Gal β [1 \rightarrow 4]Glc.

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